REVIEW

BETA- AND GAMMA-RAY SPECTROSCOPY. Edited by Kai Siegbahn. Pp i-xxiii+959. North Holland Publishing Company, Amsterdam. 1955. Price £7. 12. 0.

This book is a comprehensive treatise on the theory and experimental methods of the study of β- and γ-ray spectra. Besides the introduction written by the Editor himself, there are altogether 26 chapters and 8 appendices written by different specialists working in these lines. The very fact that the Editor has secured the cooperation of an international team of 42 such specialists in writing the different chapters clearly indicates his attempt to incorporate in the treatise authoritative treatments of the different problems in the theoretical and experimental domains of this subject, and even a brief survey of the different chapters will convince the reader that the Editor has been thoroughly successful in this attempt.

The introduction contains a brief but masterly survey of some of the main experimental methods and of the conclusions drawn from the experimental results.

The first chapter contributed by W. Paul and H. Steinwedel and the second chapter written by C. M. Davisson deal respectively with the interaction of β-electrons and γ-rays with matter. The existing theories have been discussed and the experimental results have been compared with those deduced theoretically in these two chapters. The theories and design of different types of β-ray spectrometers have been discussed by K. Siegbahn in Chapter III. This chapter extending over 47 pages includes beautiful diagrams and reproductions of some spectra recorded on photographic plates and also by automatic recording system. The fourth chapter dealing with crystal diffraction spectroscopy of nuclear γ-rays has been written by J. W. M. Dumond whose own contributions in this line are well known. The scintillation method has been discussed by P. R. Bell in the fifth chapter using 33 diagrams to illustrate the observed results. The sixth chapter has been contributed by four writers. S. C. Curran has dealt with proportional counter spectrometery, H. Bulbright has discussed the use of a high pressure proportional counter in β-ray spectroscopy and G. Bishop and R. Wilson have discussed some special methods in γ-ray spectroscopy, such as measurement of photoneutron and photoproton energies. In Chapter VII. A. C. G. Mitchell has discussed the methods of counting coincidences between beta-rays and gamma-rays or between two γ-rays, and application of the method in the measurement of internal conversion electrons, determination of efficiency of γ-ray counters, etc. In the next chapter he has dealt with the investigations of disintegration schemes and H. Slätis has discussed various methods of preparing sources for beta-ray spectroscopy and the thin films on which these surces are spread. M. E. Rose has given in brief the theory of allowed β-decay in Chapter IX and the theory of internal conversion in Chapter XIV. The theory of forbidden β-decay has been

given by E. Konopinisky in Chapter X. C. S. Wu has described experiments on shapes of β-spectra due to allowed and forbidden transitions in Chapter XI and in the next chapter O. Kofoed-Hansen has described some experiments on recoil of neutrino and has discussed the significance of the results.

The theory of multipole radiation has been investigated in detail by S. A. Moszkowski in Chapter XIII. The shell model of the nuclei has been discussed in detail by J. H. D. Jensen in Chapter XV. In the next chapter M. Goeppert-Mayer has dealt with classification of β-transitions including a table giving spin of the daughter nuclei, half life, branching ratio etc. In the same chapter M. Goldhaber and A. W. Sunyar have discussed the classification of nuclear isomers. Unified nuclear model has been discussed by A. Bohr and B. R. Mottelson in Chapter XVII. Measurement of short life times of excited states by delayed coincidence methods has been discussed by R. E. Bell and measurement of such life times by studying the resonant scattering of γ-rays has been dealt with in detail by K. G. Malmfors in Chapter XVIII. The next chapter dealing with angular distribution of nuclear radiation has been contributed by six specialists who have themselves made valuable contributions in this line of research. H. Frauenfelder has covered 68 pages dealing with angular correlation, incorporating in the treatment the theory of γ-γ direction correlation in free nuclei and a general theory of angular correlation. Similarly, α-γ and β-γ directional correlations as well as methods for the determination of several nuclear constants have also been discussed by him. R. J. Blin-Stoyle, M. A. Grace and H. Halban have surveyed the experimental methods used in investigations with oriented nuclei, and the experimental results have been discussed in detail. Finally, S. R. Groot and H. A. Tolhoek have given the theory of angular effects of radiations from oriented nuclei in the same chapter.

In Chapter XX, I. Bergstrom has described in detail the results of investigations on Auger electrons emitted by radioactive atoms and has discussed the significance of the experimental results, R. Wilson has dealt with internal pair formation at different ranges of energy and C. S. Wu has discussed internal *bremstrahlung*. The next chapter deals with the application of scintillation technique to the study of particular problems. Discussions on the application to the study of the Compton effect by P. E. Cavanagh, on the usefulness of the technique in a search for double β-decay by H. Fulbright and on its use in the study of annihilation of positrons by S. de Benedetti, R. E. Bell and M. Deutsch have been incorporated in this chapter.

Some typical resuls of investigations on the artificial disintegration of nuclei have been discussed in Chapter XXII by R. E. Bell, D. E. Alburger, A. C. G. Mitcell and P. Preiswerk and in the next chapter N. Feather has dealt with β- and γ-disintegration of some heavy radio elements with Z greater than 80. The next two chapters are devoted to γ-radiation. D. E. Alburger has discussed the γ-radiation observed in charges particle reactions and B. B. Kinsey has discussed the emission of γ-rays after neutron capture. Measurement of disintegration rate has been discussed in Chapter XXVI by J. L. Putman.

In Appendix I, M. Davisson has given absorption coefficients of various elements for photon of energies ranging from .01 Mev. to 100 Mev. The other appendices complied by different workers give Fermi functions, forbidden β-decay functions, internal conversion coefficients, values of some parameters used in directional correlation, critical X-ray absorption energies, details of β-ray spectra of some elements and values of $B\rho$ for different values of Kev.

It can be easily seen from the summary of the contents given above that the treatise under review will be useful as a valuable book of reference not only to research workers, but also to post-graduate students interested in nuclear physics. Of course, thd price is beyond the reach of students of average means, but considering the fact that the number of figures exceeds 400 and the number of pages 1000, the price is found to be only moderate.

S. C. S.

Professor Meghnad Saha, F.R.S.

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